

## Corrigendum

# Corrigendum to “The Role of Descending Modulation in Manual Therapy and Its Analgesic Implications: A Narrative Review”

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In the article titled “The Role of Descending Modulation in Manual Therapy and Its Analgesic Implications: A Narrative Review” [1], there was an error in the interpretation of the data presented by Plaza-Manzano et al. (2014). Therefore, in the Spinal Manipulation section, the sentence “Both cervical and thoracic groups saw decreases in neuropeptides and oxytocin, as well as increases in orexin A plasma concentrations following respective interventions” should be corrected to “Both cervical and thoracic groups saw increases in neuropeptides and oxytocin, as well as decreases in orexin A plasma concentrations following respective interventions.”

Additionally, in the Conclusion section, the text reading “Nearly all types of manual therapy have been shown to elicit a neurophysiological response that is associated with the descending pain modulation circuit; however, it appears that different types of manual therapy work through different mechanisms (Table 1). For example, while massage therapy appears to elicit an oxytocin response, spinal manipulation does not. It is crucial that more higher quality research be performed to better understand these mechanisms, as it can lead to a better understanding of how each therapy can be applied to drive more specific clinical research” should be corrected as follows.

“Nearly all types of manual therapy have been shown to elicit a neurophysiological response that is associated with the descending pain modulation circuit; however, it appears that potential analgesic responses to different types of manual therapy may be modulated by different mechanisms (Table 1). For example, while osteopathic manipulative therapy appears

to elicit a  $\beta$ -endorphin response, conventional massage does not. It is crucial that higher quality research with better controls be carried out to better understand potential mechanisms, as this will lead to a better understanding of how each therapy may be applied to drive more specific clinical research.”

Finally, Table 1 should be corrected as follows.

TABLE 1: Neurophysiological response to manual therapy variations.

Study	Subjects	Control/sham	Variation	Findings
Degenhardt et al. [38]	7 women and 3 men with ( $n = 10$ ) and without ( $n = 10$ ) low back pain	Light-touch	OMT	$\uparrow \beta$ -endorphins $\uparrow$ PEA
McPartland et al. [39]	Osteopathic patient population ( $n = 31$ )	Sham manipulation	OMT	$\uparrow$ AEA
Vernon et al. [40]	27 healthy males	(1) Control group laid supine on a treatment table (2) Sham group received joint play maneuvers	SMT	$\uparrow \beta$ -endorphins
Christian et al. [42]	40 male subjects who were chiropractic patients and students with and without pain	Sham (joint taken to end-range of motion)	SMT	$\rightarrow \beta$ -endorphins
Sanders et al. [43]	9 males and 9 females with acute (<2 weeks) low back pain	Sham group ( $n = 6$ ) received light touch at L4/L5-S1	SMT	$\rightarrow \beta$ -endorphins
Plaza-Manzano et al. [44]	30 graduate school students	No treatment	SMT	$\downarrow$ orexin A $\uparrow$ neuropeptides $\uparrow$ oxytocin
Skyba et al. [47]	113 male Sprague-Dawley rats	(1) Vehicle w/manipulation (2) Vehicle w/anesthesia (3) Drugs w/anesthesia	Knee manipulation	Serotonin-mediated Norepinephrine-mediated Non-GABA-mediated
Martins et al. [48]	8 male Swiss mice per group	(1) Control (2) Sham	Ankle joint mobilization	EO-mediated <sup>†</sup>
Martins et al. [49]	8 male Swiss mice per group	(1) Control (2) Sham	Ankle joint mobilization	CBR-mediated <sup>†</sup>
Martins et al. [50]	8 male Swiss mice per group	(1) Control (2) Sham	Ankle joint mobilization	Adenosine-mediated <sup>†</sup>
Martins et al. [53]	8 adult male Wistar rats per group	(1) Sham (2) Sham w/anesthesia (3) Sham w/mobilization (4) Crush (5) Crush w/anesthesia	Ankle joint mobilization	$\downarrow$ glial cell activation
Paungmali et al. [56]	7 female and 17 males with lateral epicondylalgia	(1) Placebo (2) Control	MWM	No increase in tolerance over treatment period
Paungmali et al. [55]	4 female and 14 males with lateral epicondylalgia	(1) Placebo (2) Control	MWM	Non-EO-mediated <sup>†</sup>
Santos et al. [61]	Male Wistar rats	(1) Control (2) Injury only (3) Sham (4) Sham w/mobilization	NM	Dynorphin-mediated
Kaada and Torsteinbø [64]	6 male and 6 female subjects with a history of myalgia	Connective tissue massage		$\uparrow \beta$ -endorphins

TABLE I: Continued.

Study	Subjects	Variation	Findings
Trentini et al. [66]	Male and female Sprague-Dawley rats	Control/sham (1) Control (2) Placebo	Acupressure EO-mediated <sup>†</sup>
Fassoulaki et al. [67]	4 females and 8 males without a familiarity with acupuncture	(1) Control (2) Sham	Acupressure $\rightarrow \beta$ -endorphins
Day et al. [68]	17 women and 14 men who were healthy and free of pain	Control	Conventional massage $\rightarrow \beta$ -endorphins $\rightarrow \beta$ -lipotropins
Agren et al. [69]	13–21 Male Sprague-Dawley rats	Control	Conventional Massage Oxytocin-mediated <sup>†</sup>
Turner et al. [70]	26 nulliparous women that cycle	(1) Positive emotion (2) Negative emotion	Conventional massage $\uparrow$ oxytocin
Bello et al. [71]	14 males	Control	Conventional massage $\uparrow$ oxytocin $\rightarrow$ arginine vasopressin
Morhenn et al. [72]	50 females and 45 males	Rest	Conventional massage $\uparrow$ oxytocin $\downarrow$ $\beta$ -endorphins
Hernandez-Reif et al. [73]	13 women and 11 men with >6 months low back pain	Relaxation therapy	Conventional massage $\uparrow$ dopamine $\uparrow$ serotonin
Hernandez-Reif et al. [74]	34 women with stage 1 or 2 breast cancer	Control (medical treatment-only)	Conventional massage $\uparrow$ dopamine $\uparrow$ serotonin
Field et al. [75] <sup>*</sup>	Review		Conventional massage $\uparrow$ dopamine $\uparrow$ serotonin
Hart et al. [76]	Nineteen women with anorexia nervosa	Control (standard treatment-only)	Conventional massage $\uparrow$ dopamine
Lund et al. [77]	19 fibromyalgia patients	Guided relaxation	Conventional massage $\uparrow$ corticotropin releasing factor
Bilhult et al. [78]	32 women with breast cancer	Attention	Conventional massage $\uparrow$ oxytocin
Tsuji et al. [79]	7 Japanese boys with Autism Spectrum Disorder and their mothers	Control (no massage, crossover)	Conventional massage $\uparrow$ oxytocin
Rapaport et al. [80]	29 females and 24 males	Light touch	Conventional massage $\rightarrow$ oxytocin $\downarrow$ arginine vasopressin
Rapaport et al. [81]	23 females and 22 males	Light touch	Conventional massage $\uparrow$ oxytocin (acute) $\rightarrow$ oxytocin (chronic)

\*denotes review; <sup>†</sup>denotes a conclusion inferred from naloxone or relevant antagonistic response.

## References

- [1] A. D. Vigotsky and R. P. Bruhns, "The role of descending modulation in manual therapy and its analgesic implications: a narrative review," *Pain Research & Management*, vol. 2015, Article ID 292805, 11 pages, 2015.